Those who have followed his researches, no less than those who are not acquainted with the illuminating results of his work, will heartily welcome this small volume (one of a new American series, inspired, as the editors tell us, by the series of British monographs on physiology and biochemistry), in which he has collected his scattered papers and woven their contents into a clearly co-ordinated and simple story.

The book deals mainly with the neuro-muscular system of "the three simpler phyla of the multicellular animals, the sponges, the cœlenterates, and the ctenophores," but some of the most illuminating passages in the work deal with the survival of such primitive mechanisms in the heart, the alimentary canal, and other parts of the higher vertebrates. This much-tilled field of research was well worth re-cultivating; and Prof. Parker has been able to clear away much of the uncertainty and confusion in the results obtained by earlier workers, and to bring to light many new points that had escaped notice before.

Although it must be obvious that the functions of the most primitive nervous system, as an instrument to quicken and direct the response to changes in the animal's environment, presuppose the existence of a muscular system to perform such quick and precise actions, it remained for Prof. Parker to discover that the differentiation of muscle did actually precede the appearance of a nervous system.

Another important feature of the book is the convincing series of ingenious experiments to clear up the difficulties of the problem of nervous transmission in sea-anemones.

Prof. Parker seems to adopt the tradition of the text-books of physiology for students that the most primitive type of nervous system is of the two-celled receptor-effector type—simply a specialised sensory cell put into connection with a neighbouring muscle either directly or through the intermediation of a nerve-cell. But it is difficult to conceive of the biological usefulness of such an arrangement of isolated neuro-muscular units; and, so far as I am aware, there is no evidence of its existence, except in conjunction with a system that links up the whole organism. As Prof. Parker himself has shown (pp. 94 and 95), stimulation of one spot (in an animal provided with the most primitive type of nervous system) excites a response of the whole animal, and not merely of a single muscle-fibre.

G. ELLIOT SMITH.

OUR BOOKSHELF.

A Practical Handbook of British Birds. Edited by H. F. Witherby. Part i. Pp. xvi+64. (London: Witherby and Co., 1919.) Price 4*s.* net.

ORNITHOLOGY, judged by its voluminous and ever-increasing literature, is to be regarded as one of the most attractive branches of natural science studied in the British Isles, and the works devoted to our native birds are amongst the most popular of all. The appearance of yet another book on British birds may be welcomed, since it brings our knowledge of the subject up to date. In recent years great changes have been made in the scientific nomenclature of ornithology, and, alas! are still in progress, while the recognition of numerous racial forms among the birds on the British list has rendered the study of the varied members of our avifauna difficult, especially for the field observer, and hence has given a great impetus to collecting. In addition to these major changes, important advances have been made in our knowledge of the many and complicated movements of migratory birds witnessed on our shores; and also the periods of moulting and other changes in plumage. All these come within the scope of the work under consideration.

The information under each species is divided into sections, and dealt with throughout in uniform order. These sections include keys to the various groups from orders to species, plumages, nesting, food, distribution, etc. While this method of treatment has its advantages in brevity, it detracts much from the literary aspect of the work, and renders it unattractive reading. Though the plan has been carefully carried out, the sections lack uniformity in treatment, inasmuch as those devoted to plumages are redundant as compared with the rest. The shorter the accounts of plumages the better, provided they are adequate, for unnecessary details are neither conducive to lucidity nor helpful. As regards the illustrations, the coloured plates (of which there are to be twelve) are good, and the text figures (which are numerous), though satisfactory on the whole, are in many cases poor, and in others unnecessary. It is a sign of the times that a handbook on British birds, professedly compact and concise, should run to 1200 pages. The work is to be issued at intervals in eighteen parts, and when complete will form two volumes.

Soils and Fertilisers. By Prof. T. L. Lyon. Pp. xxii+255. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1918.) Price 6*s.* 6*d.* net.

THIS little book is written chiefly for elementary students in secondary agricultural schools, for short-course students in colleges, and for teachers attending summer courses. A good deal of the material is drawn from the author's well-known larger work on soils, which was written for senior students. In spite of differences of conditions here and in the United States, the English teacher will find the book of interest as being a compact summary of the points which an American teacher brings before his students.

The first three chapters deal with soil formation, a subject which in this country is left to the geologist, the soil student taking the soil as he finds it and not concerning himself with its origin. Then follows a section on soil water, which in many parts of the States is of great practical importance, and in any case presents many features of scientific and educational interest.

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The author distinguishes three forms of soil water: hygroscopic water, a thin film absorbed from the air and condensed on the particles of the dry soil; capillary water, also a film, but thicker than the preceding, taken up by soil in contact with liquid water and held by surface forces; and gravitational or free water, which can drain away, and, indeed, should be allowed to do so wherever it assumes unduly large proportions. No mention seems to be made of the mole plough, which, in this country, has proved of great value in drainage work. Afterwards comes a chapter on the bacteria of the soil, followed by one on soil air and soil temperature.

The remainder of the book deals with fertilisers. It is evident that American farmers suffered much less from shortage of fertilisers than did our own farmers as the result of the war. For, whilst an English book written, like the book before us, in 1918 would have been compelled to devote much space to substitutes and to revise considerably the descriptions of processes and comparative standards, the author did not find such alterations necessary, and his chapters differ little from what might have been written before the war.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Credibility of Long-continued Experiments.

AT the Rothamsted Experimental Station certain experiments are continued for a long series of years in order to amass sufficient data to allow of proper statistical treatment. Some of the experiments have been carried on since 1843, others since 1852, 1856, 1860, etc. A characteristic feature of the work is the length of time for which particular observers are responsible for their records, some being in charge of the same work for twenty, thirty, or forty years. The fundamental weakness in such long-continued experiments is one inherent in human nature itself: errors once introduced are apt to persist, and to cause much harm unless they are soon detected.

In many of the experiments it is not possible to institute any very satisfactory check on the results. In some cases, however, this can be done. The measurements taken at the rain and drain gauges afford an instance, and the agreement is so close as to deserve record.

In 1870 three drainage gauges and one rain gauge were set up at Rothamsted, each 1/1000 acre in area. The rain gauge is simply a very large funnel embedded in the soil; the drain gauges are also large funnels, but filled with soil to depths of 20, 40, and 60 in. respectively. In constructing them, however, the soil was not disturbed, but was left in its natural position, whilst the framework of the gauge, by an ingenious arrangement, was built round it. From 1870 to the present day readings have been taken of the amounts of water percolating through the drain gauges: this amount being some 40 to 60 per cent. of the water collecting in the rain-gauge. Samples of the water from each gauge are then sent to the laboratory, where the chlorine and nitric and ammoniacal nitrogen are determined. This work went on without intermission from 1888 until 1916, when it was suspended owing to the sudden death of Dr. N. H. J. Miller, who had been in charge the whole of the time.

The results have now been calculated out and added up.

It is well established that soil neither absorbs nor gives up chlorine to water containing sodium chloride in solution, therefore the amounts of chlorine found in the drain gauges ought to be equal to that in the rain gauge if the numerous separate records were accurate. Over a short period there is always liable to be a difference, because some of the chlorine may not yet have had time to percolate, but over a long period this is eliminated. The actual results obtained at Rothamsted are:—

Chlorine in lb. per acre.

Average per annum for 4 years	From drain gauges			From rain gauge
	20 in.	40 in.	60 in.	
1882–92	12·24	13·27	12·45	12·25
1892–96	14·15	15·19	14·24	14·35
1896–1900	16·26	17·61	16·07	17·90
1900–04	17·67	18·65	17·79	17·23
1904–08	16·23	16·18	16·00	16·75
1908–12	19·57	18·86	20·67	18·48
1912–16	19·02	18·93	19·58	19·54
	Total amounts for 28 years			
1888–1916	460·56	474·76	467·20	466·00

The number of measurements involved is very large; there are some 18,000 readings at the gauges and a large number of titrations in the laboratory. The gauge-reading has to be multiplied by its titration value, and the resulting figures are then added up Considering the multiplicity of the data, the agreement in the results is remarkable; the widest divergence over twenty-eight years is only 2 per cent.

This close agreement is the result of careful daily work, and not of accident. There is no correspondence in the laboratory between the rain and the drainage samples; this is prevented by the carry-over of water and of chlorine in the drain-gauges from day to day, and even month to month. Nor is there any possibility of straining readings to compel agreement; the figures were not regularly added up during the course of the work, but only at rare intervals.

The result shows how accurately continuous observations can be made provided care is taken. The readings at the gauges have throughout been taken by Mr. E. Grey, who without fail and in all weathers has stuck to the work. The titrations were made by the late Dr. Miller, who would have felt great pride in the final result had he lived to see it. Fortunately, Mr. Grey is still in charge of the gauges.

E. J. RUSSELL.

Rothamsted Experimental Station, Harpenden.

The Lustre of Some Feathers of Humming Birds.

THE brilliantly metallic feathers of the crests and gorgets of most humming birds, which are also erectile, must have a great significance, and present an interesting problem. Why should the most intense brilliancy be on those particular spots?

An explanation suggested itself while observing a doctor examining the throat of his patient, in bright sunshine, by the help of a laryngoscope fixed upon his forehead, his patient being placed with his back to the light.

Holding a humming bird, in *bright* sunshine, in front of the corollæ of flowers that were turned away from the light, the illumination of the inside of the corolla was most striking, and its use in revealing any small insects it might contain became quite apparent.

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